Drought Barrier Modeling 2015

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California Department of Water Resources

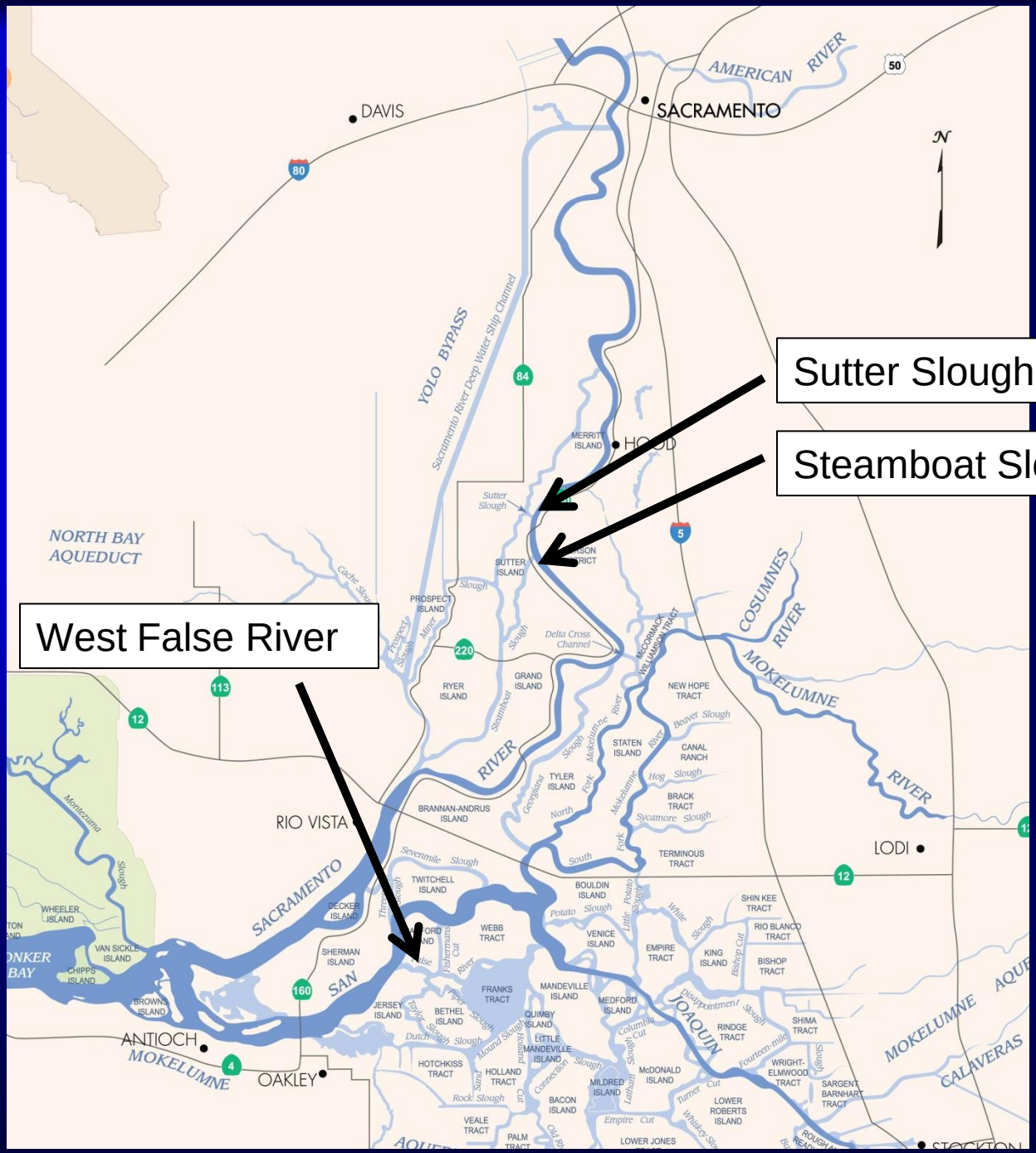
Acknowledgements

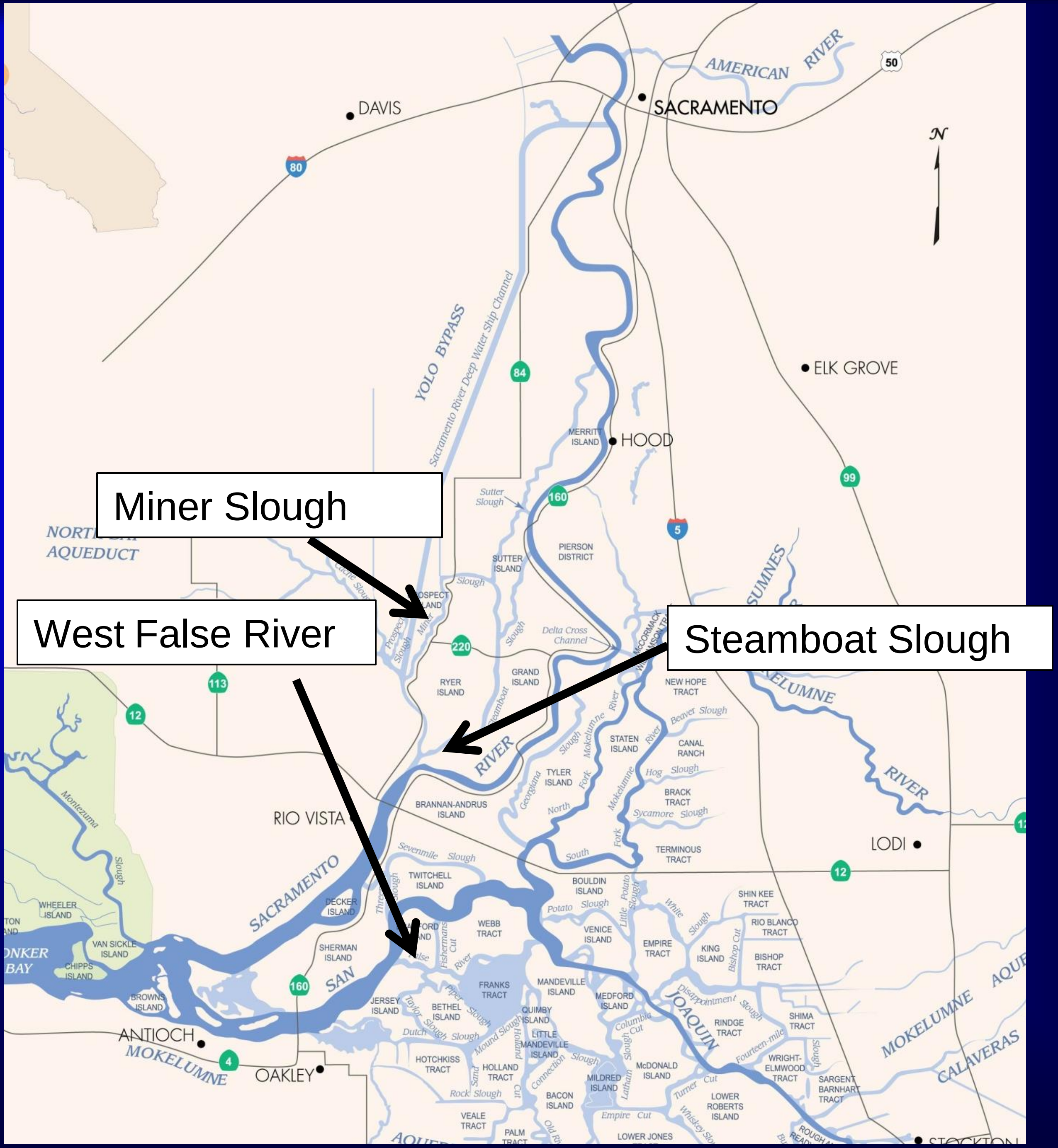
- Operations and Maintenance
  - James Edwards, Reza Shacheraghi, Siqing Liu, Dan Yamanaka, Aaron Miller
- Delta Modeling Section
  - Ming-Yen Tu, Eli Ateljevich, Bob Suits, Nicky Sandhu

Questions to Address

- What modeling did BDO do to determine that DWR would put in the False River barrier but not the Steamboat and Sutter Slough barriers?
- What did the modeling show?
- How did the modeling results compare to the actual water quality conditions over the last couple of months?
- What modeling did BDO do to evaluate the impacts of taking the barrier out?

What modeling did BDO do to determine that DWR would put in the False River barrier but not the Steamboat and Sutter Slough barriers? What did it show?


Sutter Slough
Steamboat Slough
West False River
DAVIS
SACRAMENTO
AMERICAN RIVER
YOLO BYPASS
Sacramento River Deep Water Ship Channel
NORTH BAY AQUEDUCT
HOOD
MERRITT ISLAND
SUTTER ISLAND
PROSPECT ISLAND
RYER ISLAND
GRAND ISLAND
Delta Cross Channel
Steamboat Slough
Sutter Slough
COSUMNES RIVER
MOKELUMNE RIVER
NEW HOPE TRACT
STATEN ISLAND
CANAL RANCH
TYLER ISLAND
BRACK TRACT
TERMINOUS TRACT
LODI
RIO VISTA
BRANNAN-ANDRUS ISLAND
SACRAMENTO RIVER
SAN JOAQUIN
TWITCHELL ISLAND
BOULDIN ISLAND
SHIN KEE TRACT
RIO BLANCO TRACT
BISHOP TRACT
VENICE ISLAND
EMPIRE TRACT
KING ISLAND
WEBB TRACT
SHERMAN ISLAND
DECKER ISLAND
WHEELER ISLAND
VAN SICKLE ISLAND
CHIPPS ISLAND
BROWNS ISLAND
FRANKS TRACT
MANDEVILLE ISLAND
MEDFORD ISLAND
JERSEY ISLAND
BETHEL ISLAND
QUIMBY ISLAND
LITTLE MANDEVILLE ISLAND
RINDGE TRACT
SHIMA TRACT
WRIGHT-ELMWOOD TRACT
SARGENT BARNHART TRACT
HOTCHKISS TRACT
HOLLAND TRACT
MILDRED ISLAND
McDONALD ISLAND
BACON ISLAND
LOWER ROBERTS ISLAND
VEALE TRACT
PALM TRACT
LOWER JONES
ANTIOCH
OAKLEY
MOKELUMNE
CALAVERAS
STOCKTON
80
84
5
50
113
12
220
4
160


Miner Slough
West False River
Steamboat Slough
SACRAMENTO
DAVIS
AMERICAN RIVER
YOLO BYPASS
Sacramento River Deep Water Ship Channel
ELK GROVE
HOOD
MERRITT ISLAND
NORTH BAY AQUEDUCT
PIERSON DISTRICT
SUTTER ISLAND
RYER ISLAND
GRAND ISLAND
NEW HOPE TRACT
STATEN ISLAND
CANAL RANCH
TYLER ISLAND
BRACK TRACT
TERMINOUS TRACT
BRANNAN-ANDRUS ISLAND
RIO VISTA
LODI
TWITCHELL ISLAND
BOULDIN ISLAND
DECKER ISLAND
WEBB TRACT
VENICE ISLAND
SHERMAN ISLAND
FRANKS TRACT
MANDEVILLE ISLAND
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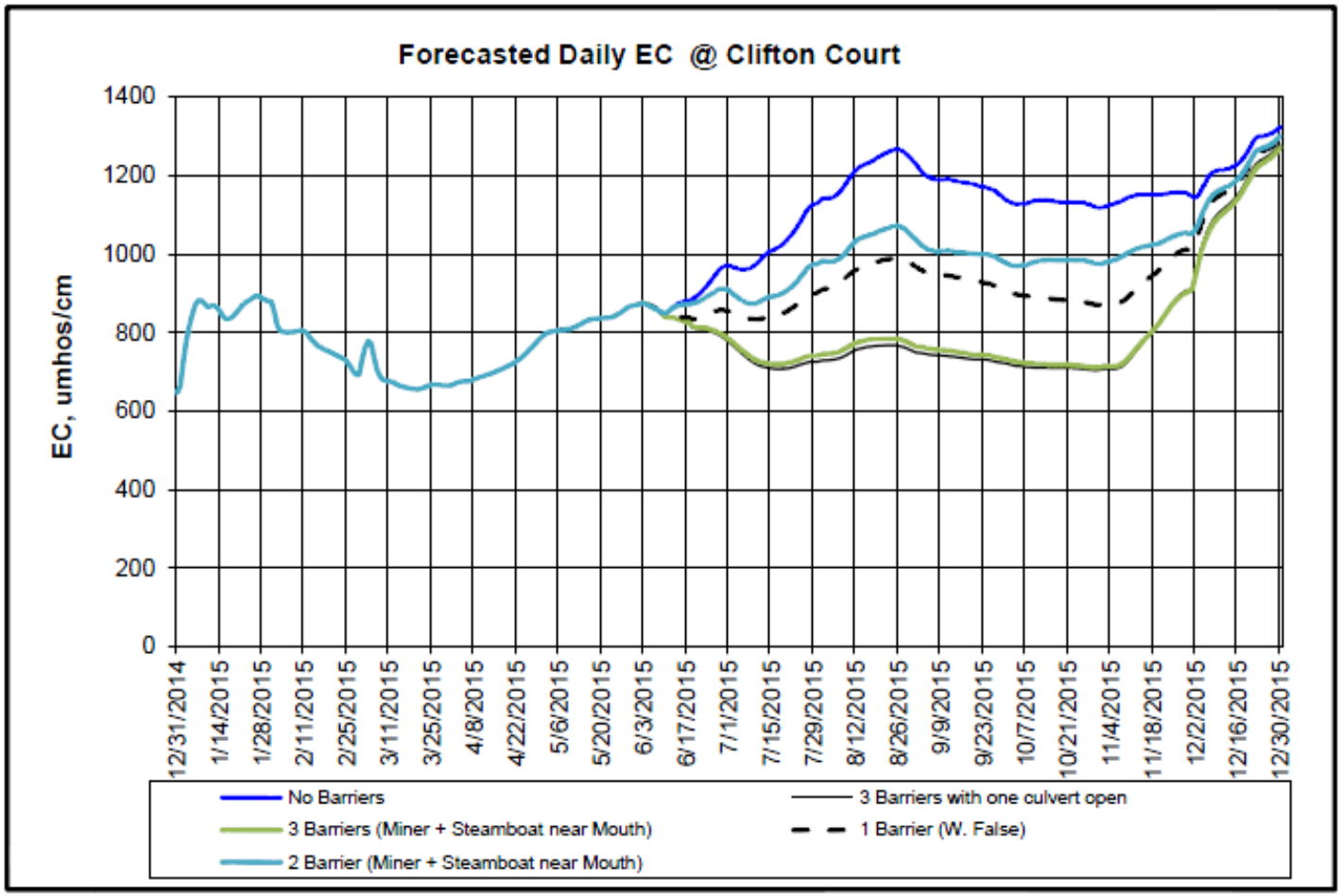
BACON ISLAND
VEALE TRACT
MILDRED ISLAND
McDONALD ISLAND
WHEELER ISLAND
VAN SICKLE ISLAND
CHIPPS ISLAND
BROWNS ISLAND
SACRAMENTO RIVER
SAN JOAQUIN
MOKELUMNE RIVER
CALAVERAS
STOCKTON

Water Quality Using Hydrology for IS-MND

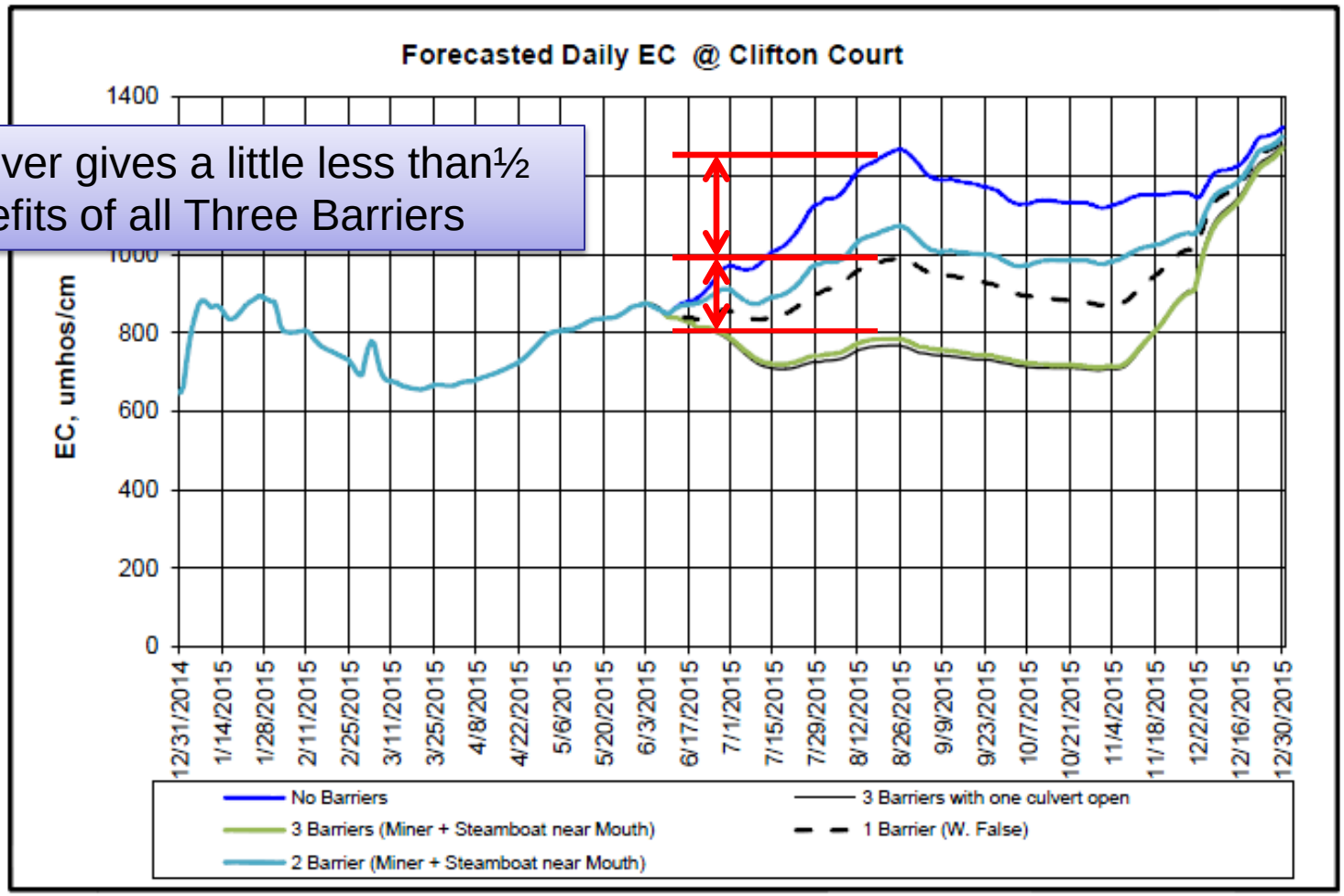
(Initial Study – Mitigated Negative Declaration)



Water Quality Using Hydrology for IS-MND

(Initial Study – Mitigated Negative Declaration)

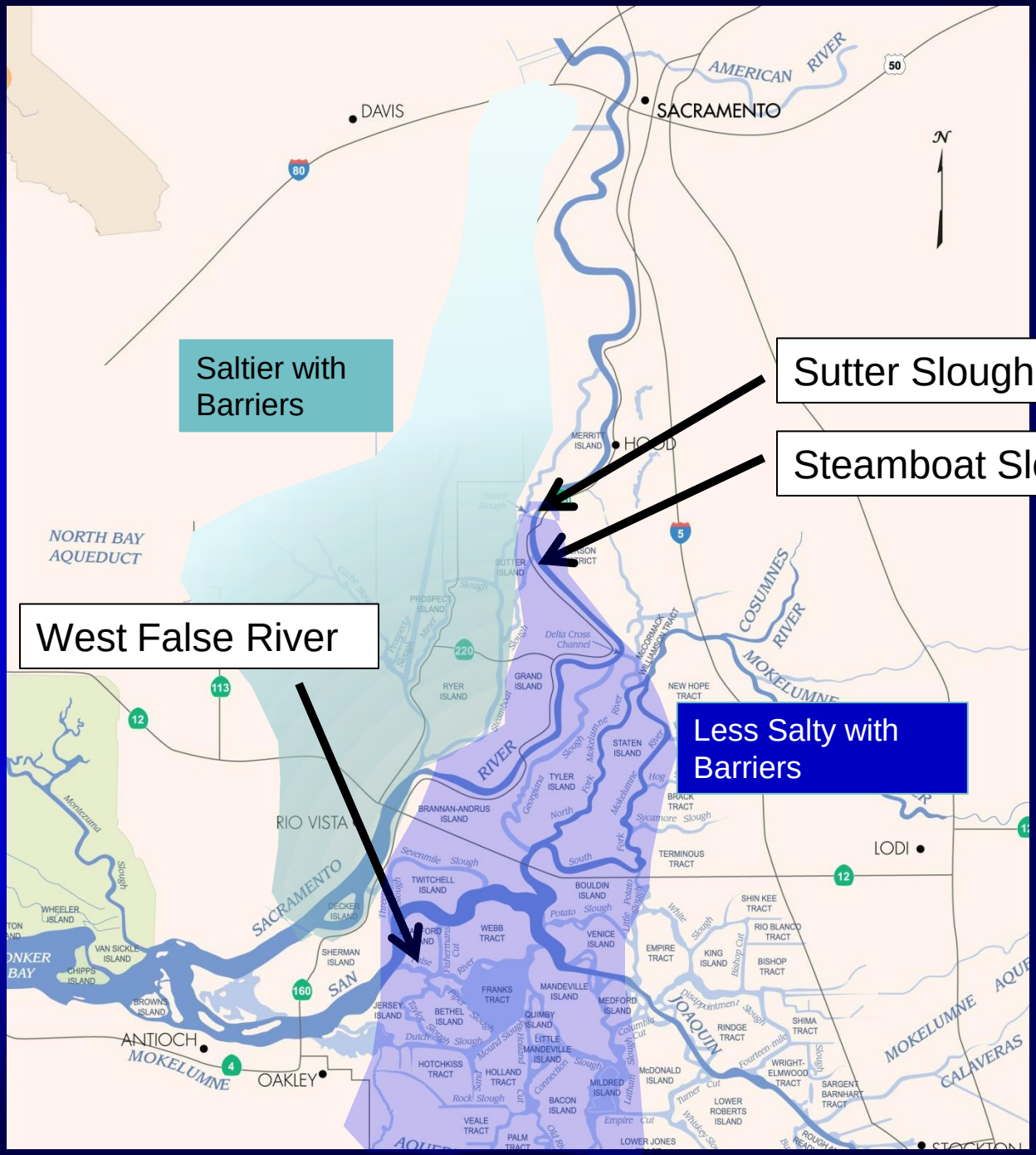
False River gives a little less than½ the benefits of all Three Barriers



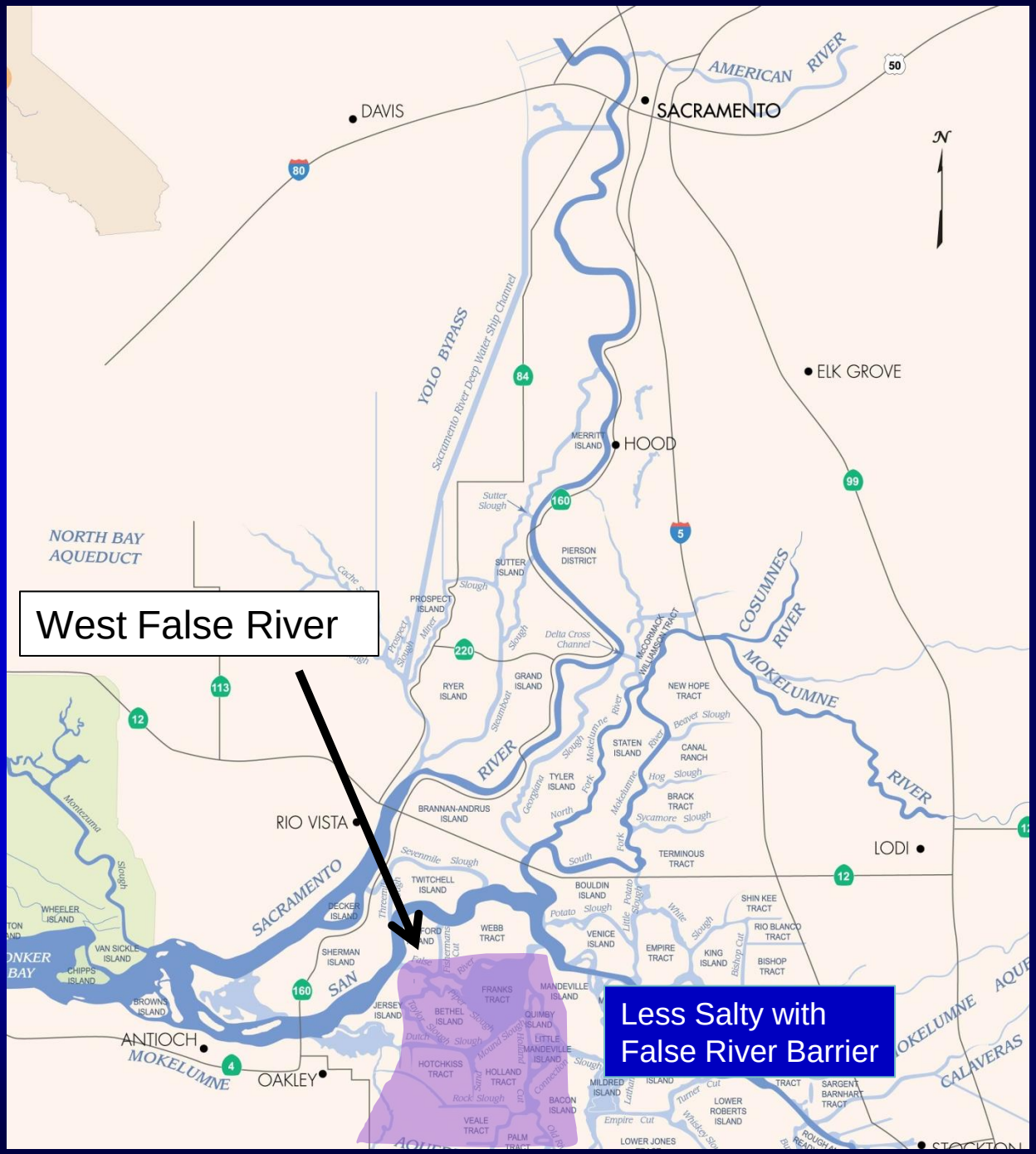
Decision Against Miner/Steamboat Barriers

- Not based entirely on modeling
- Concerns for endangered species by Regulatory Agencies
- Risk Management

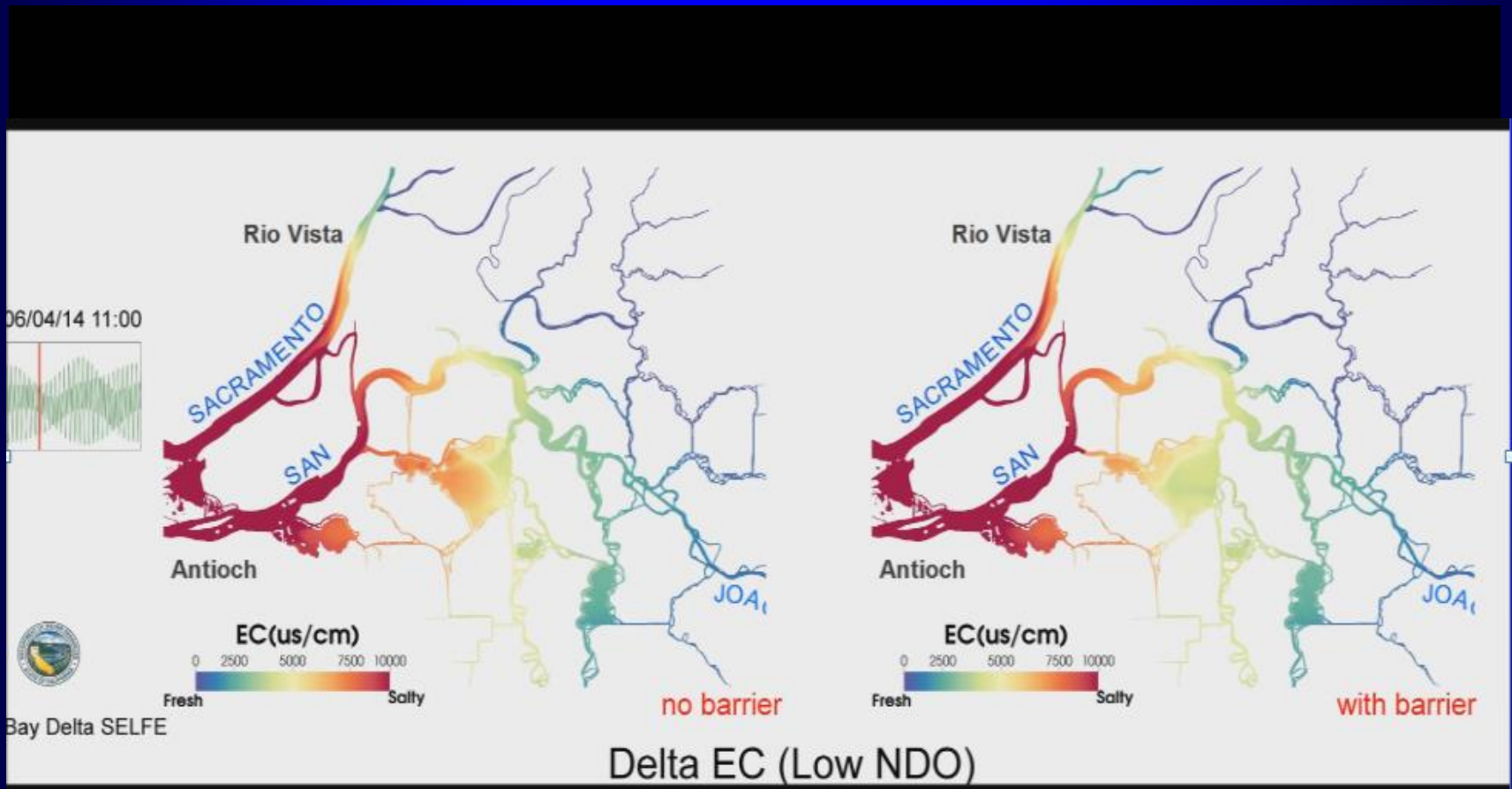
General Pattern of Salinity Impacts



General Pattern of Salinity Impacts

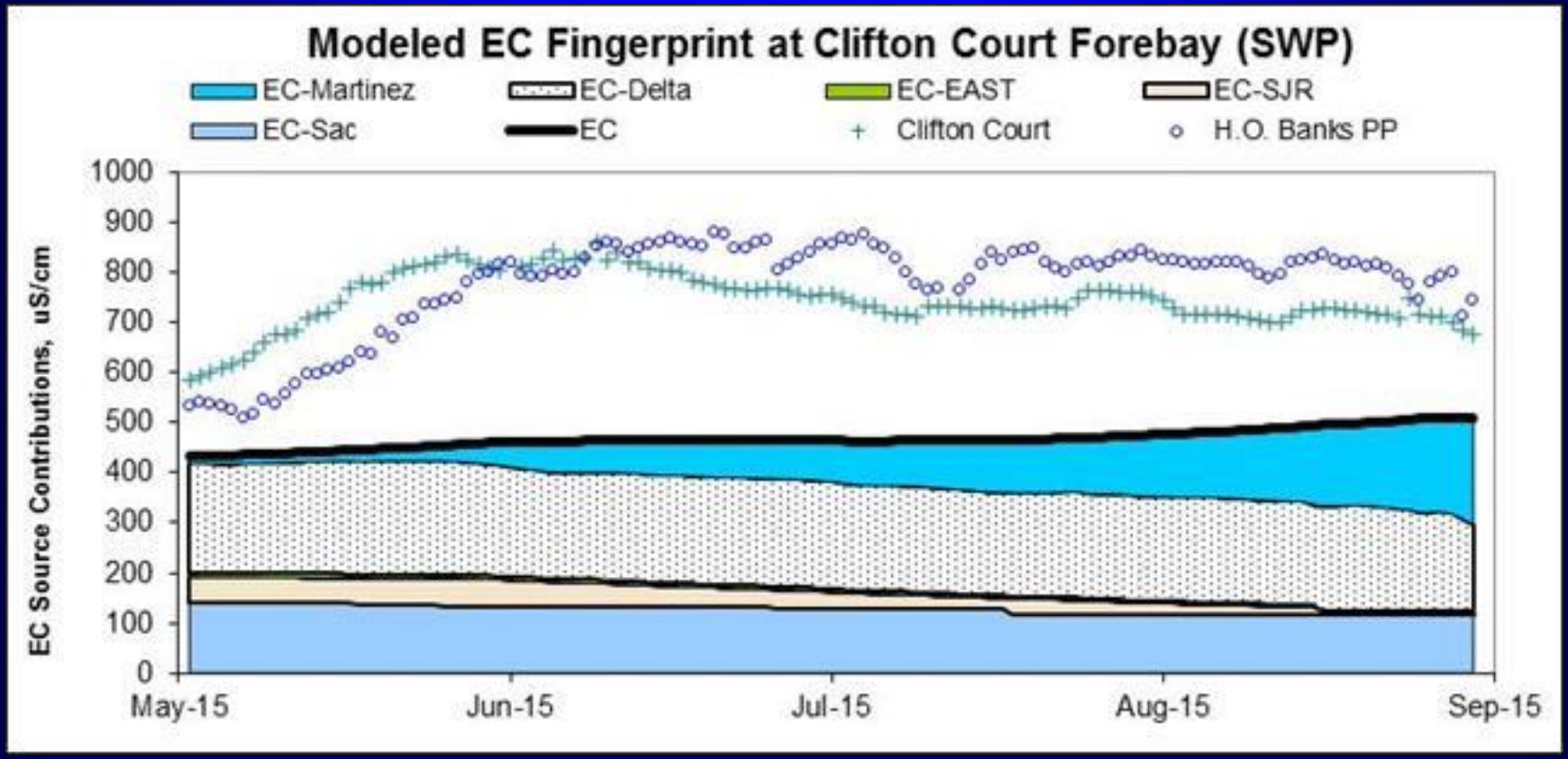


Salinity Intrusion – “Disaster Scenario”

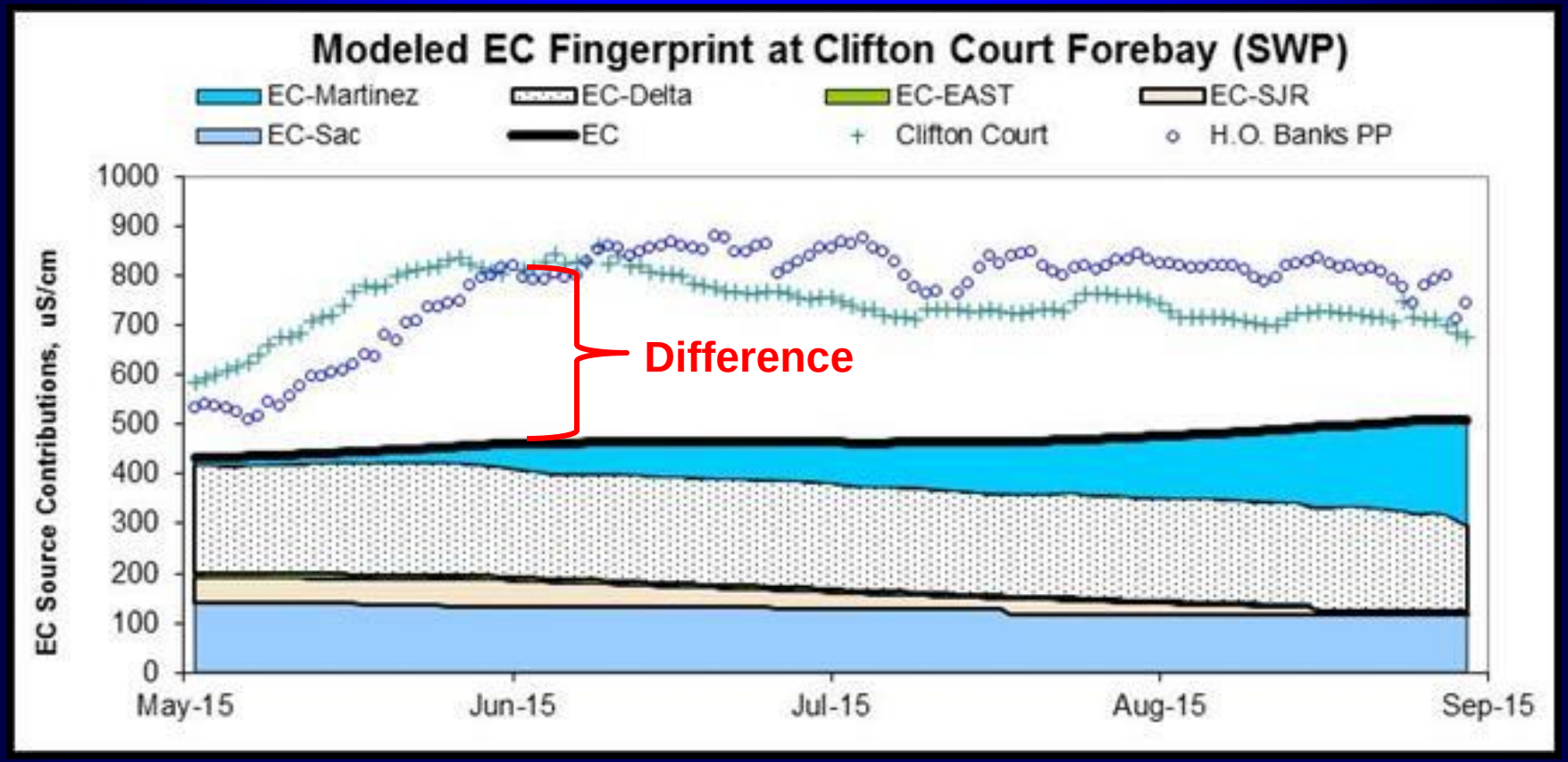


How did the modeling results compare to the actual water quality conditions over the last couple of months?

DSM2 Historical Fingerprint



DSM2 Historical Fingerprint



Why Significant Water Quality Difference?

- Theories
  - Cold Start
  - Calibration isn't robust in extremely dry hydrologies
  - Inaccurate boundary input data – Consumptive Use
  - One dimensional model limitation

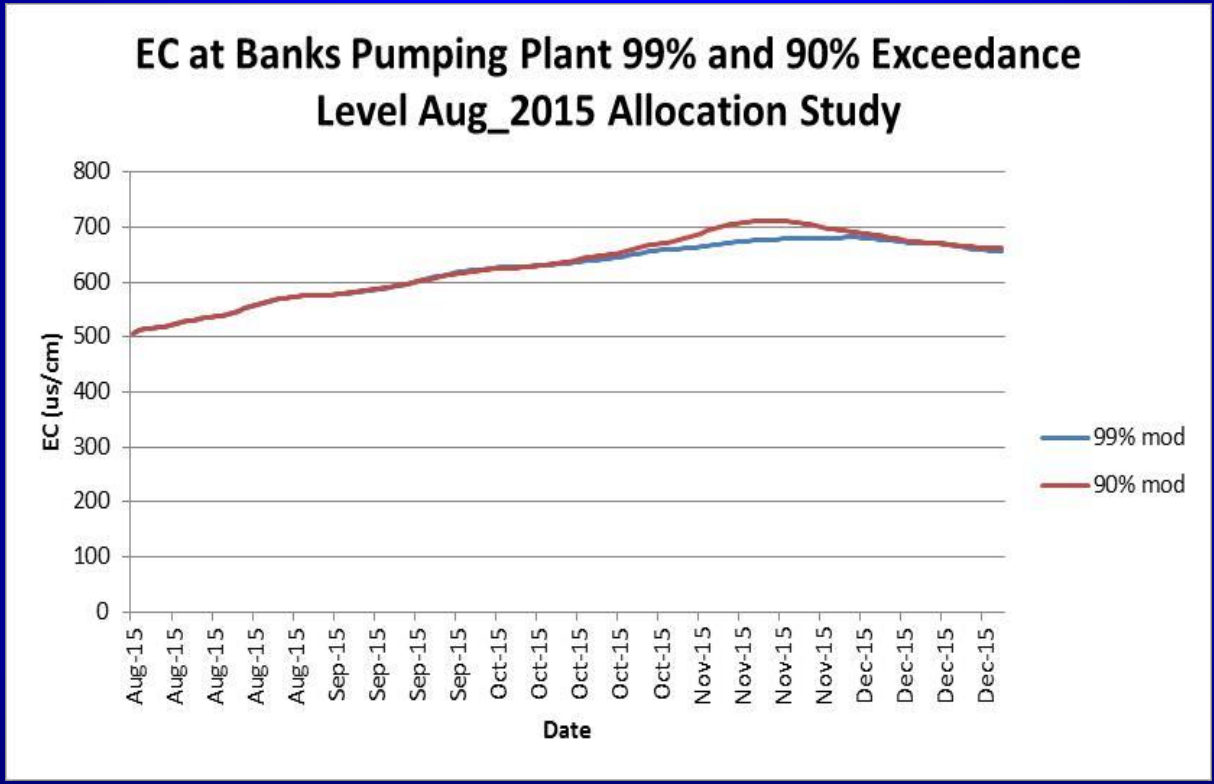
Work Done to Improve Model Accuracy

- Warm Start
- Sensitivity Tests with Calibration Parameters
- Correct consumptive use errors in Yolo Bypass area
- Sensitivity tests with different Consumptive Use Values
- Run Multi-D Model SCHISM

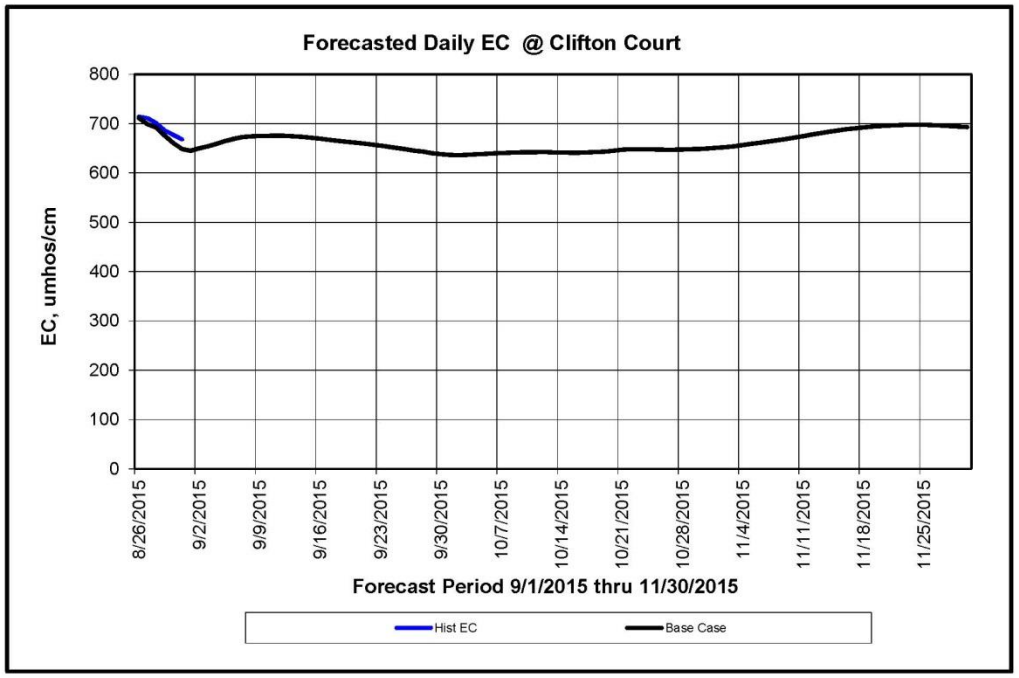
- What modeling did BDO do to evaluate the impacts of taking the barrier out?

September 2015 Forecast

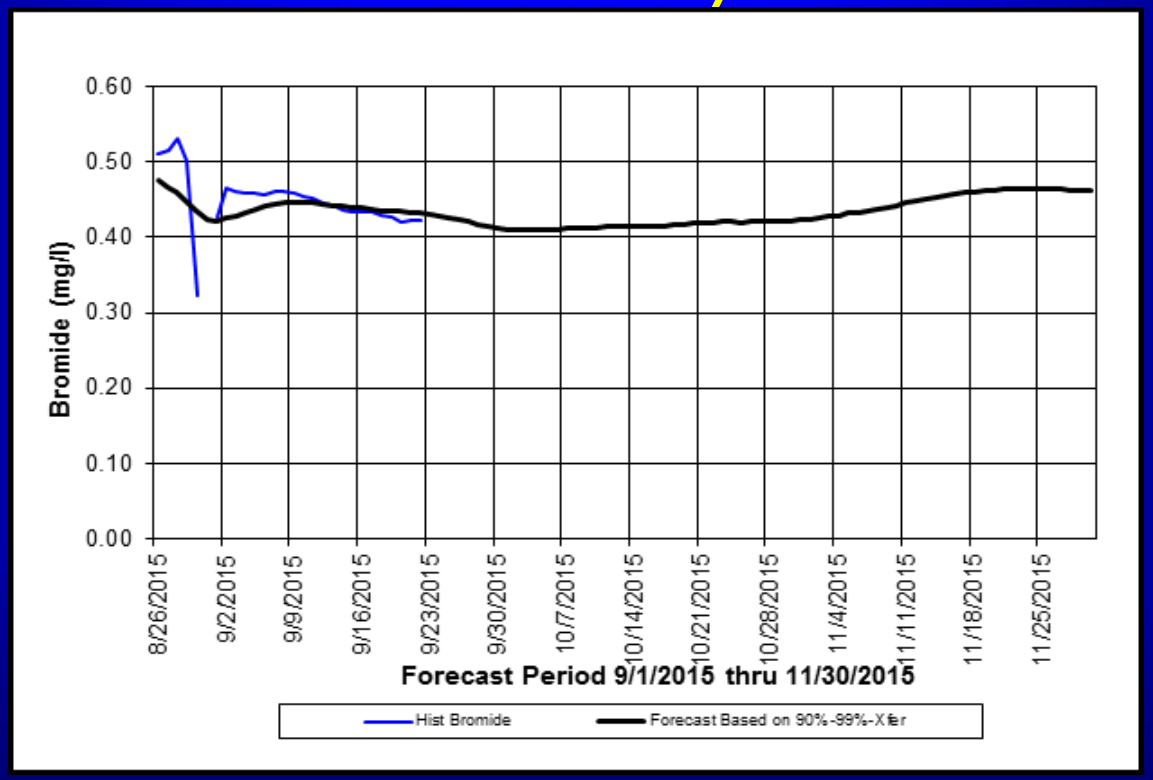
August DSM2 Forecast



September DSM2 Forecast (using Aug DCO Forecast)

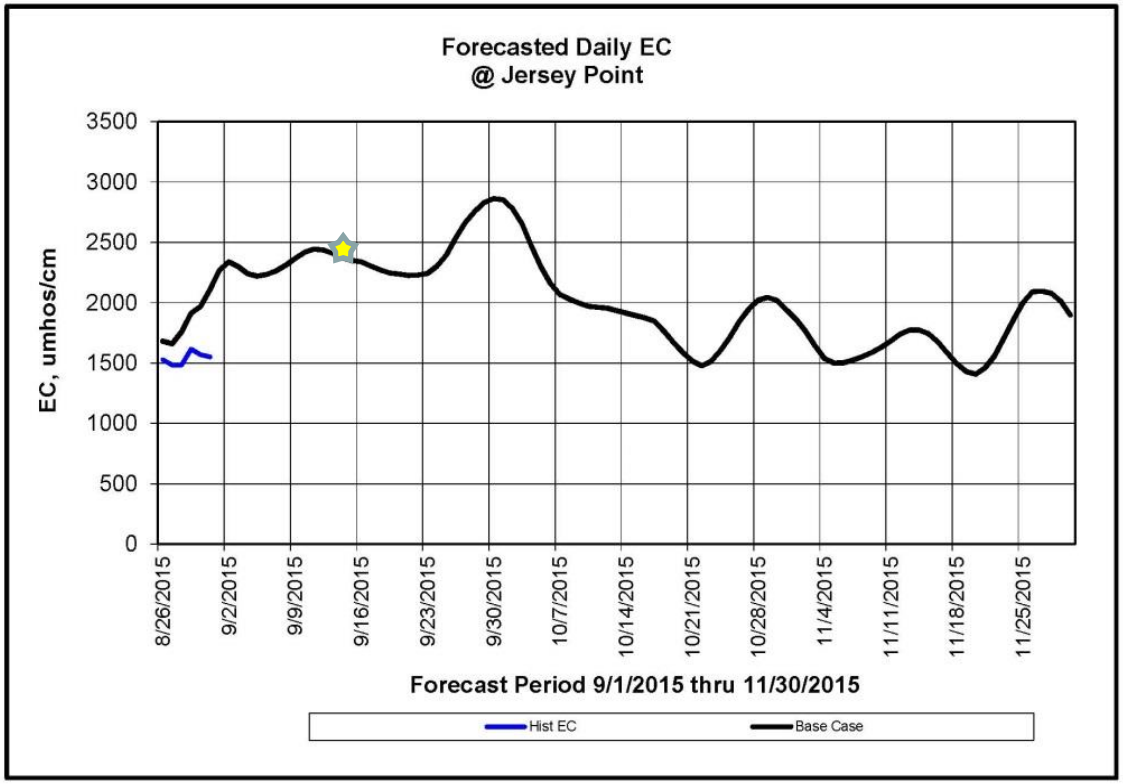


Bromide Forecast - Converted from EC Values using DSM2 (using August DCO Forecast)



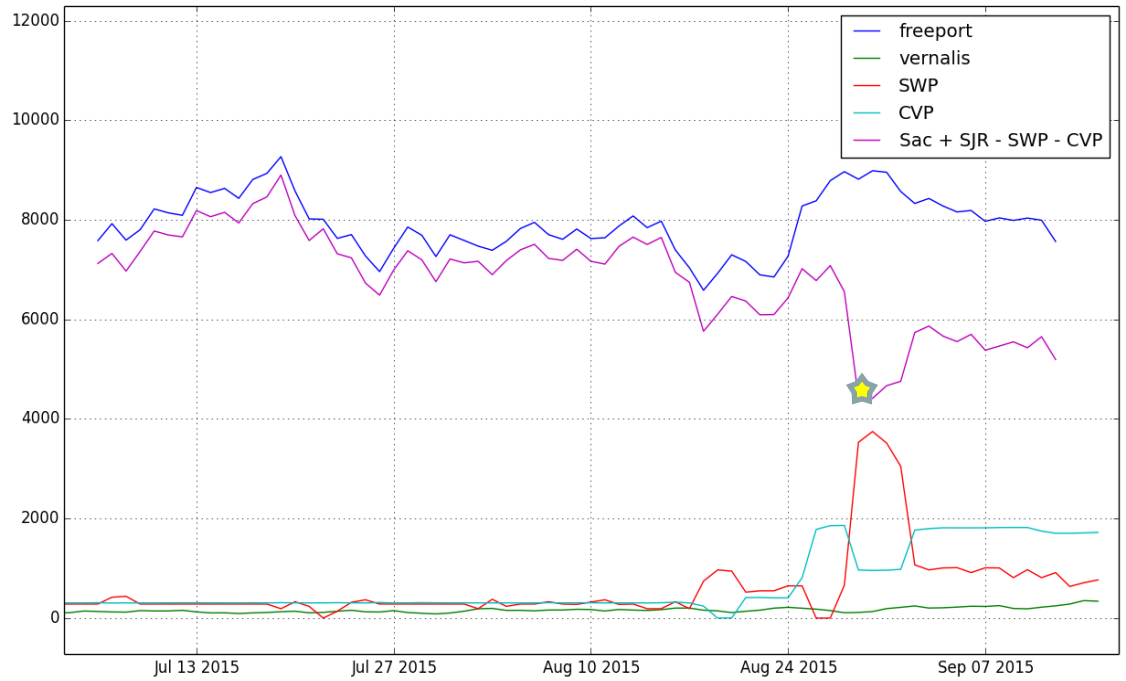
	Type of Simulation	Type of DSM2 Simulation Initialization	False River Barrier Installation and Removal Assumptions
Historical DSM2 Fingerprint August 2015	Historical Boundary Conditions	Cold Start	Barrier installed end of May
DSM2 Aqueduct Seasonal Forecast August 2015	Forecasted Boundary Conditions	Cold Start	Barrier removed instantaneously on October 31
DSM2 September Seasonal Forecast Using August 2015 DCO Forecast	Forecasted Boundary Conditions	Warm Start	Barrier slowly removed from Oct 1- Nov 15

DSM2 Sep Forecast EC at Jersey Point (Using August 2015 DCO Forecast)

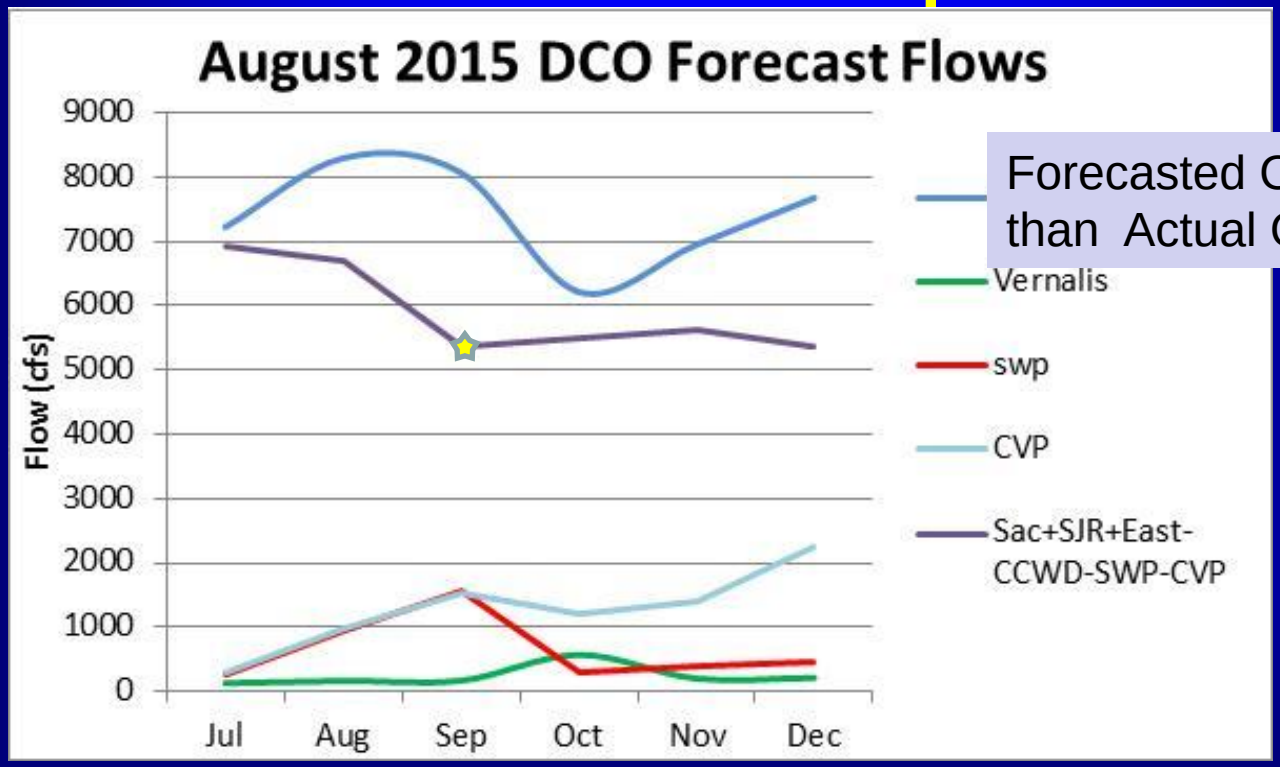


Observed EC Data Jersey Point

Why the Difference?
Observed Flow and Export Data (CDEC)

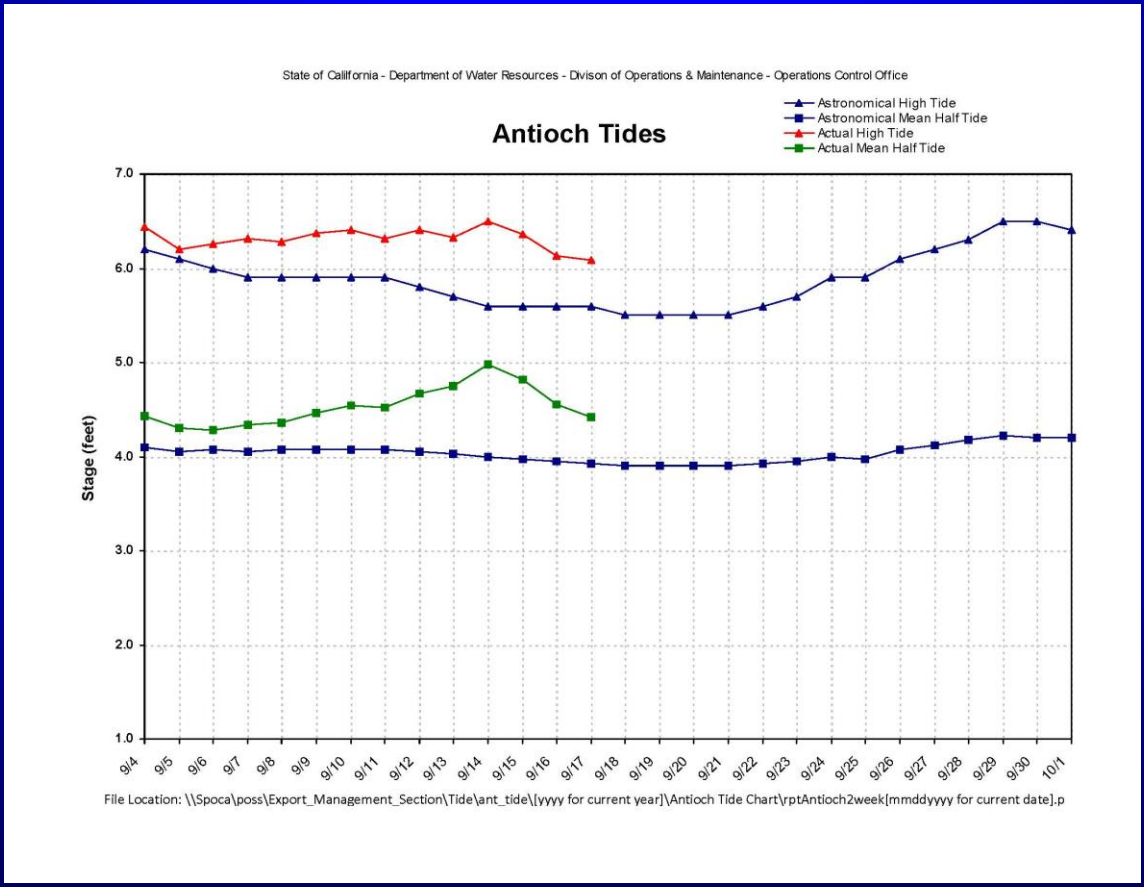


August 2015 DCO Forecasted Flows and Exports

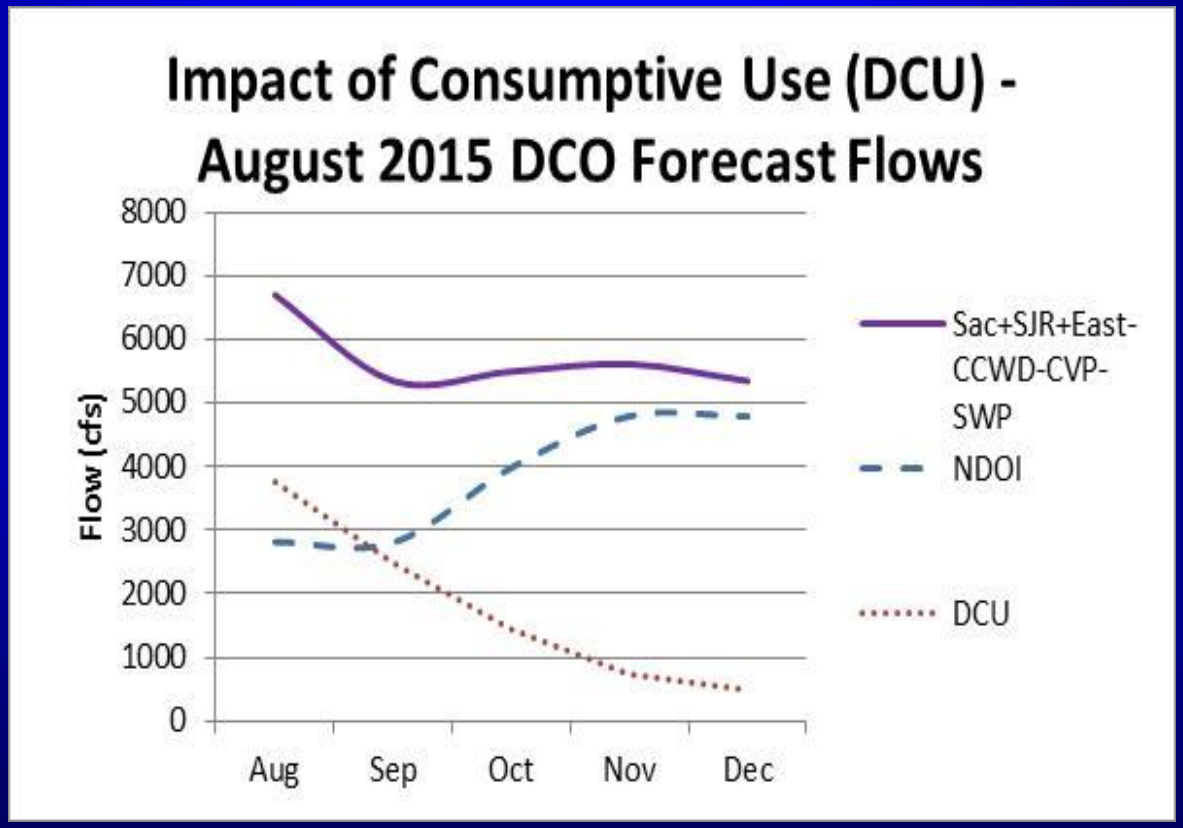


Forecasted Outflow higher than Actual Outflow

Actual and Astronomical Antioch Tides

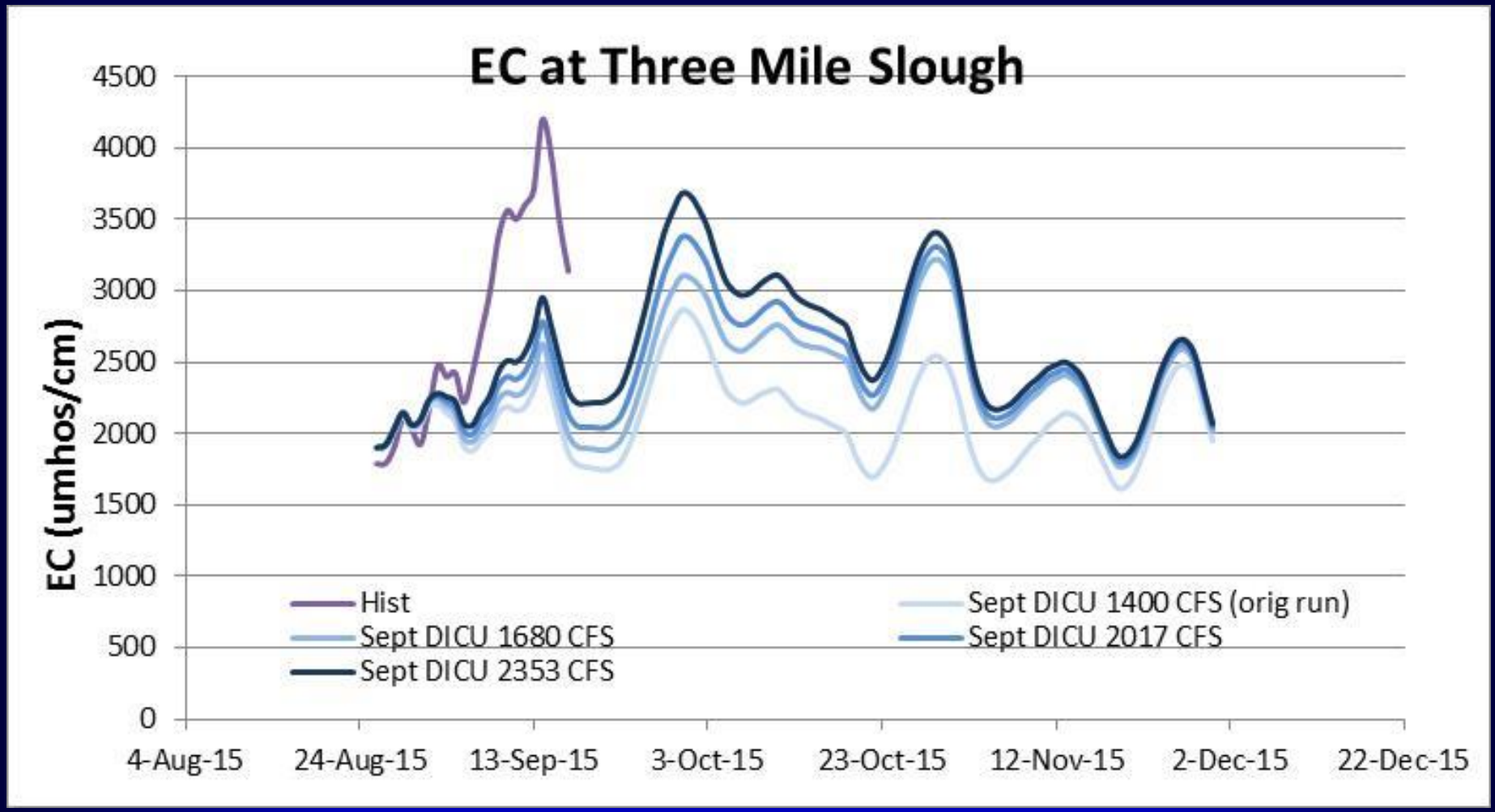


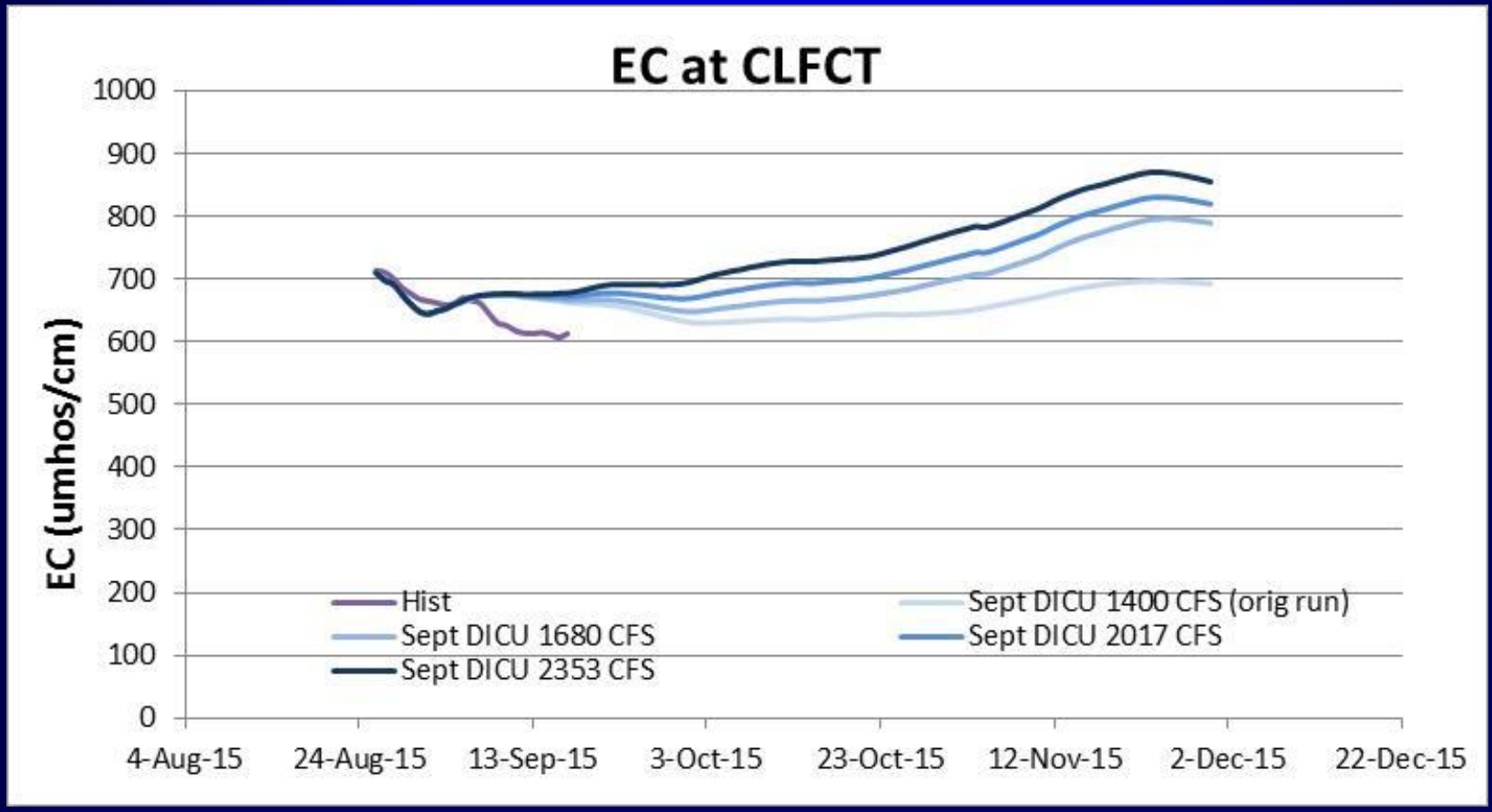
Inflows, Exports, NDOI and Net Channel Depletions



Sensitivity Tests

- Modified stage at boundary
- Modified Consumptive Use
- Adjusted mannings n


EC at Three Mile Slough
EC (umhos/cm)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
4-Aug-15
24-Aug-15
13-Sep-15
3-Oct-15
23-Oct-15
12-Nov-15
2-Dec-15
22-Dec-15
Hist
Sept DICU 1680 CFS
Sept DICU 2353 CFS
Sept DICU 1400 CFS (orig run)
Sept DICU 2017 CFS


EC at CLFCT
EC (umhos/cm)
1000
900
800
700
600
500
400
300
200
100
0
4-Aug-15
24-Aug-15
13-Sep-15
3-Oct-15
23-Oct-15
12-Nov-15
2-Dec-15
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Hist
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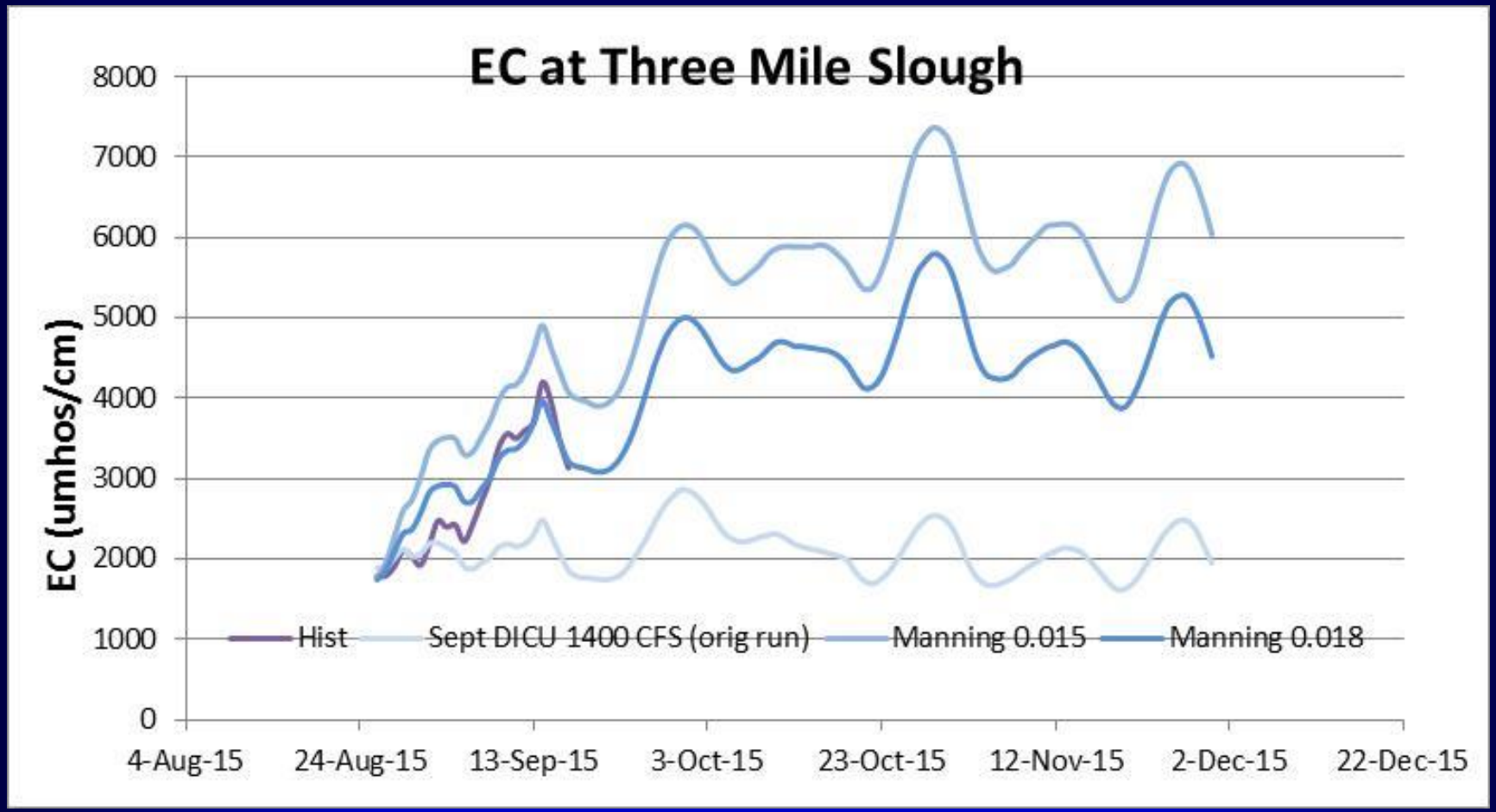
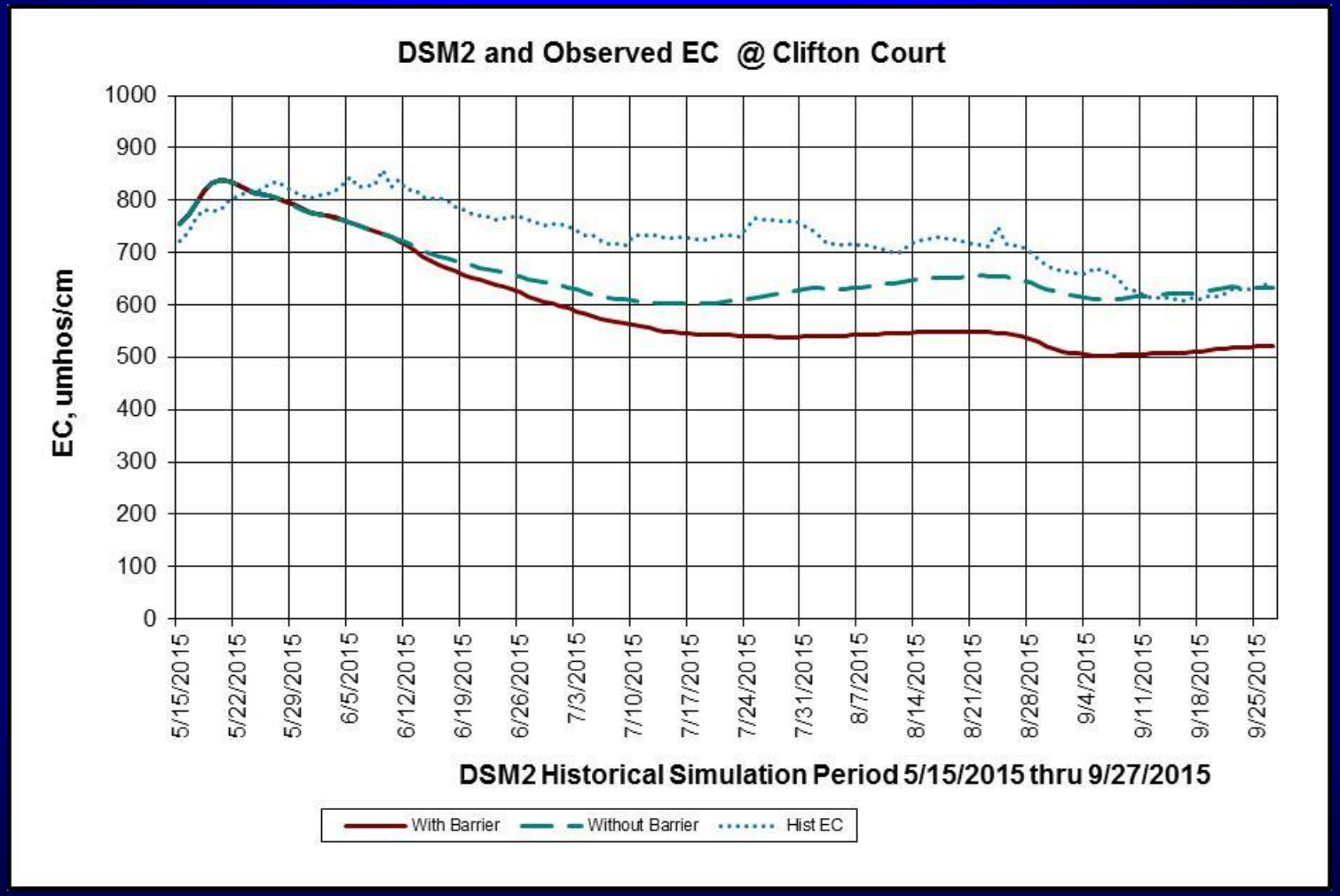

EC at Three Mile Slough
EC (umhos/cm)
8000
7000
6000
5000
4000
3000
2000
1000
0
4-Aug-15
24-Aug-15
13-Sep-15
3-Oct-15
23-Oct-15
12-Nov-15
2-Dec-15
22-Dec-15
Hist
Sept DICU 1400 CFS (orig run)
Manning 0.015
Manning 0.018

Historical DSM2 Simulations with and without Barrier

Historical Simulation With and Without Barrier



Extra Slides